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USSR Report

ENERGY

(FOUO 9/81)

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CONTENTS

ELECTRIC POWER

WORK CONTINUES ON CONSTRUCTION OF CHERNOBYL'SKAYA AES

Moscow ENERGETICHESKOYE STROITEL'STVO in Russian No 4, Apr 81 pp 2-6

[Article by candidate of technical sciences V. S. Konviz: "The Second Phase of the Chernobyl'skaya AES"]

[Text] At the present time, work is being conducted at the site of the Chernobyl'skaya AES on installations of the second phase of construction, while the third phase has already been begun. The second phase will have the same output as the first, which was basically completed in 1978 and which has two generating sets with 1,000-MW RBMK [high-output, channel-type] reactors. With the commissioning of this second phase, the electric station's output will reach 6 million kW.

Since matters regarding the design and construction of the first phase of the Chernobyl'skaya have been systematically covered [1-4], we will note only the high operational characteristics of this electric power station. No more than six months are required to bring power units with RBMK-1000 reactors up to rated power. As early as a year after the reactors were brought up to rated power, the utilization factor of their rated capacity reached 75 percent, while the operational readiness factor exceeded 90 percent.

The basic production equipment utilized in the first power units is being installed in the second phase of the AES.

In the design of the second phase, however, the speed of response and the performance of the reactor's emergency cooling systems have been considerably improved. For complete condensation of steam leaking from the circuit during possible emergencies associated with a rupture of the largest pipes in the loop used for circulation of the heat-transfer medium, provisions have been made for a bubbler basin located directly under the rigid leakproof chambers of the heat-transfer medium circulation loop. Steam can be taken up into this basin in case the main safety valves on the steam lines are actuated. Such a solution excluded the necessity of installing bubblers in the machine room with its complicated assembly of medium-pressure pipelines.

The reliability of the electric circuits and the power supply systems for internal AES needs has been improved.

The performance of the central heating installation has been increased almost twofold (to 1,470 GJ/h) which will make it possible to provide heat to population centers located in the immediate vicinity of the AES, to hothouses, etc.

In the design, a great deal of attention has been devoted to questions of protecting the environment. We will note in particular that the efficiency of the purifying equipment has been increased as well as that of the systems for suppressing the radioactivity of aerosol wastes and for special water purification. The capacity of sewage decontamination equipment has been doubled and provisions have been made for final purification of sewage in sand filters.

Atomic electric power stations in general and those with RBMK reactors in particular belong to the most labor-intensive installations in power-plant construction. In connection with this, designers and builders devote a great deal of attention to the problem of reducing the labor expended during the installation of construction and installation operations.

At atomic electric power stations with RBMK reactors, the most labor-intensive operation is the construction of massive concrete safety structures. Since these electric stations are single-circuit, such structures are characteristic not only of the reactor chamber and special buildings at the construction site, but also of the machine room where the turbine unit, condenser-purifier, condenser-supply circuit and deaerator are enclosed by massive concrete shielding.

During the construction of the first phase of the Chernobyl'skaya AES, the protective structures were made from cast-in-situ reinforced concrete. The complexity of erecting these structures increased because it was impossible to use large-diameter sheathing and difficult to insure a good-quality facing surface due to the large number of engineering shafts and embedded structural elements. Associated with this, about 200,000 m^2 of concrete surface on each power unit had to be plastered before the special protective covering was applied. A considerable portion of the partitions and walls were made from brick and these were also plastered.

In order to reduce the amount of labor expended and the length of time needed to erect such structures, it was necessary during the second phase of the construction of the AES to make maximum utilization of precast and prefabricated cast-in-situ reinforced concrete structural members as well as to reduce the number of individually standing buildings at the construction site and the number of operational lines between them and the main building. However, the complex configuration of the framework of the AES buildings and the lack of standardization in structural dimensions have hindered the application of precast and prefabricated cast-in-situ structural elements. The ordering of three-dimensional layout solutions for the main building was complicated by the fact that the selection of the basic production equipment and the arrangement of the nuclear steam-generating installation in the second phase of construction had to be retained without changes, that is, the same as in the previous stage.

It was particularly difficult to do this in the reactor section, since the reactor units, the special water-purification unit separating them and the repair unit had different three-dimensional layouts and were constructed from different structural elements.

The overall width of the reactor unit (72 m) and the width of its central room (24 m) were used as the determining dimensions in the designs of the reactor sections. The reactor units (retaining the layout of the nuclear assembly and the transportation equipment) were turned to face one another. The remaining systems of the reactor section were located between them with all dimensions in the plan reduced to the dimensions of the construction grid by a factor of 3 m. At the same time, the equipment for special water purification and the gas systems were located in the lower portion of the building. The repair shops for "dirty" equipment in the middle section and the exhaust ventilating system with compartments for filters and the unit for suppressing the radioactivity of aerosol wastes (UPAK), previously located in a separate building, were located in the upper portion.

Immediately over the exhaust fan station on the roof of the building was installed a ventilation stack. Such a solution eliminated the necessity of constructing cumbersome ventilation boxes on the bridge between the main building, the ventilation stack and the UPAK.

A transport-engineering corridor was made along the outer perimeter of the reactor section at a height of 12.5 m. Large-scale equipment can be brought in along this corridor into the repair area and up to the rail approaches.

As we already know, the bedplate for the reactor section in the first phase of the AES was lowered to a depth of 8 m, while large areaways were situated even lower, to a depth of 13.5 m. Only after installing these areaways, which took more than six months, were we able to get on with erecting the reactor unit proper. Considerable difficulties arose during the waterproofing of the building's underground contour, upon which great demands are made.

In the design for the main building in the second phase of the AES, the flat bedplate of the reactor compartment was put on the same level as the areaways. The entire building was raised over the level of the ground water, in connection with which the height of the building's above-ground portion was increased.

The new layout of the main building provides for locating immediately alongside its rear facade the reservoirs for collecting the drain water, tanks for clean and contaminated condensate, a number of auxiliary systems which previously had been located on the production platform as well as newly created quick-response emergency cooling systems for the reactors.

Out of the special structures on the production platform, only the storage facility for radioactive wastes with its bitumenizing apparatus, connected to the main building by a transport and engineering bridge, is located separately. As a result, the so-called "dirty" zone with its several small free-standing buildings and structures has been eliminated from the general layout of the production platform.

As was already noted, in the new layout for the reactor compartment we have managed to regulate considerably the dimensions of the individual compartments and the floor plan of the building as a whole. The vertical dimensions of the majority of compartments, however, were not changed due to the necessity of retaining the arrangement of the reactor unit while they, as a rule, do not correspond to the dimensions of a standard construction grid. In connection with this, we were not able to use standard Glavenergostroyprom structural elements for the framework of the building, the walls and partitions.

The three-dimensional layout of the machine room and the deaerator stacks have not undergone any serious changes. In order to increase the fire-resistance of and decrease the amount of metal used in the frame of the deaerator stacks, the frame is made of precast reinforced concrete and not of metal, as was done in the first phase.

All the elements in the frameworks of the main buildings and a great many of the walls, partitions and sheathing to a depth of 500 mm, which had previously been made from cast-in-situ reinforced concrete or brick, were also designed from precast reinforced concrete. Massive structural elements for the walls and sheathing of more than 500 mm thickness are envisaged as being made from prefabricated cast-in-situ reinforced concrete in such structures with ribbed reinforced form panels. At the same time, engineering and cable shafts as well as embedded parts in such structures were standardized and adapted for factory manufacture.

Below are shown the volumes of the reinforced concrete structural elements (in thousands of m^3) for the main buildings of the first and second phases (in the numerator and denominator, respectively) of the Chernobyl'skaya AES:

Precast concrete and reinforced concrete	44/102
Cast-in-situ concrete	87/132
Cast-in-situ reinforced concrete:	
bedplates	46/46
walls and sheathing	110/28

It can be seen from the data cited that we have managed to reduce the volume of cast-in-situ reinforced concrete in the main building in the second phase by a factor of 2.2, retaining it primarily in the building's foundation. At the same time, more than 85 percent of the precast reinforced concrete was used for the necessary special shielding and finishing of the concrete surfaces which, when the structural elements had been made from cast-in-situ reinforced concrete, required preliminary preparation (plastering, float-work, etc.).

As was already noted, we were unable in the design of the second AES phase to restrict the use of mass-produced and standardized reinforced-concrete structural elements from USSR Minenergo catalogues.

Out of the total volume of precast concrete and reinforced concrete, 27,500 m^3 (26 percent) were used for standard structural elements and 16,800 m^3 (16 percent) for standardized reinforced form panels, while the rest went for nonstandard elements. In order to make it possible to produce these elements, we had to modify the existing equipment and construct some new. The total number of such elements exceeded 26,000; about 200 types of forms were required for their manufacture.

Such a number of standard sizes creates considerable difficulties in the production of structural elements from precast reinforced concrete and in making structures with them. Thus, during the development of a standardized design for power units with RBMK reactors, it was necessary to find a possible way of making the buildings correlate more exactly with the standard construction grid, even if it meant altering the layout of the technological equipment or slightly increasing the dimensions of the main building.

The use of nonstandard elements of precast reinforced concrete, however, made it possible to reduce noticeably the labor expended directly on the construction site and to increase the speed with which the buildings were erected.

The utilization of massive prefabricated cast-in-situ structural elements made with the use of standardized reinforced form panels proved to be most effective.

Thus, during the construction of the first two phases of the power units at the Chernobyl'skaya and Kurskaya AES's, the unit labor expenditures for the erection of the wall structural elements of almost 1,000-mm thickness from cast-in-situ reinforced concrete reached 2-2.5 man-days/kW. When using the same structural elements made from prefabricated cast-in-situ reinforced concrete, the unit labor expenditure amounted to only 1 man-day/kW (0.4 man-days/kW just for installation and about 0.6 man-days/kW for manufacturing under plant conditions and for assembly of the reinforced form blocks and mounting of the embedded parts at the construction site). The use of prefabricated cast-in-situ structural elements has also made it possible to reduce two-fold the expenditure of machine time on the installation of the blocks, reinforcing rods, forms and the delivery of concrete to the structure.

All of this has made it possible to increase considerably the speed with which the wall structures are erected. For example, the average monthly rate for erection of these structural elements in the reactor units of the first phase amounted to 1.5 to 2 m and only reached 4 m in certain months. During the installation of the third reactor unit the rate was 3.2 m, while in the first six months of 1980 it rose to 7 m.

In the final analysis, the increase in the speed with which the wall structural elements in the reactor compartments were erected provided a reduction in the total duration of AES construction, since the construction work in building these compartments is on the critical path of the combined construction network schedule.

Comparative data (in percentages) regarding the duration and labor expenditure of these construction operations in the reactor compartment of the third (denominator) and first (numerator) power units are presented below.

Duration of construction, months (percent)	5(240)/21(100)
Overall labor expenditure for construction operations from the labor expended on the construction of the third power unit	180/100
Including:	
for erecting basic structures	134/100
for operating and servicing the construction machinery and mechanisms	171/100
in ancillary manufacture, service and other facilities	228/100

We must agree that the reduction in the duration of construction within the period indicated was obtained not only as a result of the application of new technological solutions. A comparative analysis of the erection schedules for the first and second power units of the first phase shows that even with the old design solutions the duration of this stage of the work was reduced by a factor of 1.3 to 1.5 due to an improvement in the organization of construction, accumulated experience and stabilization of the collective.

Upon analysis of the labor expenditures, it must be taken into consideration that the number of cranes and machines in the main building and on the platforms for assembly of the structural elements was increased during the construction of the third power unit, whereas the total labor expenditure for servicing the construction machines was reduced considerably due to the sharp reduction in the duration of the construction.

That the reduction in the duration of construction was particularly effective can be seen in the reduction of labor expenditures in ancillary manufacture, services and other facilities (by a factor of 2.3).

The experience acquired by this time in the construction of AES's shows the practicability of further improvement of prefabricated cast-in-situ structural elements and the method of manufacturing and installing reinforced form panels and blocks made from them. In particular, it has become possible to do away with pool welding of the working fittings and thus eliminate seams between the panels in such lightly reinforced structural elements as the turbine boxes and condenser-purifiers as well as in certain wall structural elements in the deaerator stack, the reactor compartment and the liquid waste reservoir.

Figure 3 shows a prefabricated cast-in-situ reinforced concrete wall structural element made using reinforced form panels without battens. It is expected that the labor expended in erecting such structural elements will decrease by another 20 to 25 percent in comparison with the method already mastered.

Of the intrinsic shortcomings in the design of the main building of AES's with RMBK-type reactors, we must note the considerable overall dimensions of the building and the difficulty in creating such a building with even the most powerful cranes with long boom extensions, such as the BK-1000 and SKR-2200.

In the standardized designs for AES's with RBMK-1500 reactors in which plans have been made to divide the reactor compartments into several blocks with a common machine room, it is necessary that we work together with the builders to develop the placement and optimal selection of cranes.

It is also necessary to envision the feasibility of fitting out the construction site with a sufficient number of concrete pumps with controlled concrete-directing manipulators in order to free the cranes from delivering concrete mix to the structures.

It is difficult to provide a reliable evaluation of the reduction in labor expended on the installation operations before construction is completed on the third power unit of the Chernobyl'skaya AES. According to preliminary data, it will be lower than the figure for the construction of the first power unit by approximately 30 percent. In connection with this, we must mention first of all the constant work being done by specialists of the Yuzhteploenergomontazh trust on improving the technique of assembling and installing the reactor as well as on increasing the amount of assembly of pipeline systems outside the structure.[1]

There is considerable potential for reducing the labor expenditures in the ventilation systems and air ducts. In the new designs, over 80 percent of the air ducts are of circular section, which makes it possible to make them with spiral seams, using high-output equipment. We have not yet managed, however, to solve the problem of obtaining high-output ventilation equipment assembled into units and chambers for AES's currently under construction.

In addition to this, it must be noted that at the present time in the USSR Minenergo system special enterprises are being built which will manufacture ventilation system elements as well as outfit and assemble the ventilation equipment.

In connection with the increased reliability of electric power supply systems for domestic consumers, the redundancy of cable communications and the growth in the level of automation of production processes, new AES designs provide for a considerable increase in the amount of electric wiring. Since up to now it has not been uncommon for panelboard hardware to arrive at the construction site with a low degree of factory preparation and for this hardware to be finished during installation as a result of changes in the design, it is necessary to direct particular attention in new AES designs to the improvement of design decisions and a reduction in the labor expended during electric wiring operations. At the same time, we must increase our demands on the electrical equipment industry in part to reduce the overall dimensions of the equipment, to improve its reliability, completeness and the degree of factory preparation.

1. For more details see the article by A. M. Usik, A. G. Lyubenko, Yu. Lozovskiy and V. D. Deygraf: "Installation of the Steam-Generating Unit of the Third Power Unit at the Chernobyl'skaya AES", published in this issue.

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BLUE GOLD OF WEST SIBERIA

Moscow GOLUBOYE ZOLOTO ZAPADNOY SIBIRI in Russian 1981 (signed to press 30 Dec 80) pp 1-8, 160

[Annotation, foreword and table of contents from book, "The Blue Gold of West Siberia," by Sabit Atayevich Orudzhev, candidate member of CPSU Central Committee, USSR inister of Gas Industry, Hero of Socialist Labor, deputy of the USSR Supreme Soviet, doctor of engineering sciences, corresponding member of the Azerbaijan SSR Academy of Sciences, winner of Lenin and State prizes, Izdatel'stvo "Nedra," 6,000 copies, 160 pages]

[Text] Light is thrown on the modern status of and prospects for further development of the West Siberian Gas Complex.' The basic information about its raw-materials base is cited. The engineering geology, natural, climatic and other peculiarities of developing the gas and gas-condensate fields of the region, which foreordain a basically new approach to developing them industrially, are indicated. Progressive equipmental, technological and organizational solutions for drilling wells and recovering and transporting gas are set forth. The problems of rational use of gas in the national economy and of searches for reserves for saving it are described.

For a wide circle of engineers and technicians of the gas and oil industry.

There are 14 tables and 52 illustrations.

Foreword

The domestic gas industry is one of the key branches of the fuel and power complex, which determines to a great extent technical progress and the pace of development of the whole national economy.

Thanks to the constant attention and great help of the CPSU Central Committee and Soviet Government, the industry continues to be developed at an overwhelming pace. In 1979 gas recovery in the country reached 406.6 billion m^3, and in so doing achieved a record 34.4 billion m^3 of annual growth. Thus the low level of nationwide recovery that was specified for the end of the Tenth Five-Year Plan by the 25th CPSU Congress's historic decisions was exceeded by 6.6 billion m^3 a year early. Ministry of Gas Industry enterprises gave the national economy 29 billion m^3 of gas above plan during the first 4 years of the five-year plan, and tasks for realizing output and for growth in labor productivity and other technical and economic indicators were exceeded.

CPSU Central Committee General Secretary, Chairman of the USSR Supreme Soviet Presidium Comrade L. I. Brezhnev, in his letter of greeting "To the collectives of gas-industry enterprises and construction and installing organizations that are engaged in erecting facilities for the recovery, treatment and transport of gas" highly assessed the fruitful work of Soviet gas-field workers in carrying out the tasks set for developing the industry dynamically. The warm, inspiring words of the outstanding political and state figure of the day, which our industry's workers received with a feeling of great joy and deep emotion, were a powerful impulse for raising their creative activity and labor enthusiasm and inspired them to new labor accomplishments.

The gas industry now has at its disposal a firm raw-materials base and an enormous potential from the standpoints of production economics, science and technology, but the main thing is the highly qualified personnel, who have many years of experience in solving complicated and large-scale tasks.

The USSR Unified Gas Supply System (ESG SSSR), the world's largest, which effects the flexible, responsive manipulation of high-capacity streams of gas and performs the continuing industrial process of delivering gas to consumers, is functioning reliably and continues to undergo improvement. Right now the Mingazprom [Ministry of Gas Industry] system has under industrial development about 250 gas and gas-condensate deposits, the total annual capacity of gas processing plants is 65 million m^3, gas trunk pipelines are about 130,000 km long, and the total capacity of the gas-pumping units installed at compressor stations exceeds 18 million kW.

The effective development of such most important branches of the economy as the chemical industry, ferrous and nonferrous metallurgy, the oil-refining, petrochemical and cement industries, machinebuilding, metalworking and many other activities is unthinkable without the wide use of gas as a high-quality energy source and a most valuable raw material for chemicals. Its use in industrial production provides an annual increase of more than 1 percent in the productivity of social labor.

An ever-increasing amount of gas is being directed to satisfying the domestic needs of the Soviet people. The conversion of cities and urban-type settlements to the use of gas has reached 82 percent, while for rural communities it is 77 percent. About 195 million people in the USSR use natural and liquefied gas at the lowest price in the world.

The high pace of gas-industry development in recent years has been occasioned by the accelerated introduction into development of the huge fields of new regions--West Siberia, Turkmenia and Orenburgskaya Oblast. Sixteen years ago these gas-bearing regions had not even appeared on the country's economic map, yet now their share in nationwide recovery is 64 percent.

Turkmenia's fields are feeding the country's economy with high-capacity life-giving streams of gas. The pace at which the republic's gas industry was established is extremely impressive: in 1966 not one cubic meter of natural gas was being obtained here, but by the end of the Tenth Five-Year Plan total annual recovery had been brought up to 71 billion m^3. This region's existing raw-materials base will enable the level of recovery that has been achieved to be maintained, and it will also support a further increase in the near term.

A highly effective gas-and-chemicals subbranch, based upon the integrated processing of natural gas and the extraction therefrom of useful associated components, is being developed successfully. A most important achievement in this branch is creation of the Orenburg Gas Complex, which was called for by 25th CPSU Congress decisions. Right now more than 48 billion m^3 of gas are being recovered and processed per year, yielding more than 1.1 million tons of elemental sulfur of high purity, 400,000 tons of propane-butane fractions, 2.3 million tons of stable condensate, and other most valuable products that are needed for chemistry and petrochemistry, including the production of mineral fertilizers. The Orenburg complex is of great importance for developing the industry and expanding economic collaboration with the fraternal socialist countries. Orenburg gas moves over the transcontinental Soyuz gas pipeline, 2,700 km long, which was put into operation in 1978, to consuming CEMA member countries, which took part in erecting this underground arterial, the largest in Europe.

Substantial production capacity for treating gas has been created and is continuing to increase in Uzbekistan, which, as before, remains one of the large gas-recovering regions. Here, through expansion of the Mubarek and construction of the Shurtan gas-and-chemicals complexes, the amount of treatment of sulfur-containing gas is to be brought up to 25 billion m^3 per year, and the overall level of gas recovery will grow by the end of the 11th Five-Year Plan, mainly as a result of drawing into development fields already discovered in the western portion of the republic's lands.

The fields of the Ukraine, North Caucasus and the Komi ASSR, which in their time played an important role in this industry's development, have been exhausting their potential for further increase in gas recovery as a result of natural depletion of their reserves. All possible measures are being taken here to hold to a minimum the rate of reduction in the level of gas recovery.

In the modern, qualitatively new era the Soviet Union's gas industry is marked by a number of specific peculiarities that greatly complicate its development. The main centers of gas consumption are located in the European part of the USSR, while the industry's main raw-materials base is concentrated in West Siberia--a remote, poorly accessible region with very complicated natural and climatic conditions. The accelerated involvement of this gas-bearing region's huge fields in the national economy's circulation is of decisive significance for the industry's further development.

During the whole history of the domestic gas industry's development, not one gas-bearing region has known such a burgeoning and large-scale growth as West Siberia. In 1979, that is, 14 years after the delivery of Siberian gas started, the overall level of recovery had been brought up to 121.4 billion m^3, and by the end of the Tenth Five-Year Plan it is to reach more than 156 billion m^3. In so doing, growth in recovery during the five-year plan will be about 121 billion m^3, or 83 percent of the nationwide increase.

In this region, high-capacity automated enterprises are operating, at which more than 470 million m^3 of natural gas are recovered daily, mainly through development of the Medvezh'ye and Urengoy fields. The high-capacity Urengoy-Nadym-Punga-Ukhta-Torzhok-Minsk-Ivatsevichi-Dolina-Gosgranitsa, Medvezh'ye-Nadym-Punga-Nizhnyaya Tura-Perm'-Kazan'-Gor'kiy-Central Economic Region, and Urengoy-Surgut-Chelyabinsk-Petrovsk-Novopskov gas pipeline systems were built to deliver gas to customers of the country's central and western regions and the Urals, Volga and Donbass [Donets Coal Basin] regions.

During the assimilation of the giant gasfields of Siberia's North, a complex of most complicated and basically new scientific and technical problems that are associated with organizing the recovery and transport of gas in swampland and permafrost and during a long dry winter were solved for the first time in domestic and world practice. Wells of increased diameter with a withdrawal of more than 1 million m^3 of gas per day, deployed in central groups or clusters throughout the area, were drilled here, and high-capacity installations for the integrated treatment of gas whose productivity is 8-15 billion m^3 per year are used.

The gas pipelines were built with 1,220- and 1,420-mm diameter pipe that was designed for pressures of up to 75 kg-force/cm^2. Gas transfer-pumping units of 10,000-16,000 kw power were installed at the compressor stations. These and many other progressive technical and technological solutions in the fields of recovery and transport have provided for a high pace of development of the fields, with a substantial saving of capital investment and labor expenditure.

The forming of a huge regional production complex for the recovery and transporting of Tyumen' gas, which in the long term will occupy a dominating position in the national economy's overall gas supply, continues in West Siberia. A majestic program of work to build up the fields, arterial pipelines, compressor stations, electric-power transmission lines, highways, railroads, docks, airdromes, housing, and facilities for social, cultural and personal-amenity purposes is being executed here. The consistent buildup of this region's gas potential is the result of the creative and joint efforts, energy and skills of collectives of gas-field workers, geologists, builders, power-engineering workers and people of many other trades. Not like temporary newcomers, they are subduing the gas riches in a businesslike manner and on a truly Siberian scale. Major organizational and large-scale political work on mobilizing Tyumen' workers for the solution of this task, which is of statewide importance, is being conducted by the oblast party organization.

The precise, all-encompassing words that Comrade L. I. Brezhnev uttered in his report to the 25th CPSU Congress: "That which has been done and is being done in this severe district is a genuine feat. And the motherland pays tribute with admiration and respect to those hundreds of thousands of people who have been doing it," conveys convincingly the magnitude of this huge buildup of gas facilities that is being promoted in Siberia's North.

The CPSU Central Committee's draft for the 26th party congress, "The Main Directions for Economic and Social Development During 1981-1985 and During the Period up to 1990," envisions as a most important task realization of the program for the boosted development of gas recovery, which will be brought up to 600-640 billion m^3 per year--including 330-370 billion m^3 in West Siberia--by the end of the 11th Five-Year Plan.

Gas industry workers, being deeply cognizant of the enormous national-economic importance of accelerating the involvement of West Siberia's gas resources in the economic turnover are filled with resolve to greet the 26th congress of their own Leninist party with new labor accomplishments and to make a worthy contribution to the integrated solution of large-scale tasks for a further increase in gas recovery in this region.

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RESULTS, PROSPECTS OF PETROLEUM REFINING, PETROCHEMICAL INDUSTRY SUMMARIZED

Moscow EKONOMIKA, ORGANIZATSIYA I UPRAVLENIYE V NEFTEPERERABATYVAYUSHCHEY I NEFTEKHIMICHESKOY PROMYSHLENNOSTI in Russian No 2, 1981 pp 2-6

[Article by M. F. Sisin, USSR first deputy minister of Petroleum Refining and Petrochemical Industry]

[Text] The laborers of petroleum refining and petrochemical industry are meeting the 26th CPSU Congress, which marks a new stage in the creative activities of the Soviet people, with high political enthusiasm and hard work.

The preparations for the congress were a powerful lever, a new, inspiring stimulus for successful attainment of the targets of the final year of the 10th Five-Year Plan, and satisfaction of socialist pledges in honor of the highest party forum.

Petroleum refining and petrochemical industry, which plays an important role in the national economy's chemicalization and growth of its fuel and energy potential, faced extremely complex and important tasks in the 10th Five-Year Plan. They essentially entailed continually raising production effectiveness and work quality on the basis of accelerated technical progress, the fullest possible utilization of output capacities, intensification of production, and mandatory participation in economization efforts.

Special attention was turned to creating combined systems of primary and catalytic petroleum refining processes, characterized by high unit output capacity and promoting significant reduction of unit capital investments and operational expenses. As an example in comparison with similar processes employing local facilities, construction of one LK-6U system, which has an output capacity of 6 million tons per year and which handles several processes--desalinization, primary distillation, catalytic reforming, hydrorefining of diesel fuel, and gas fractionation, reduces capital investments by 11 million rubles, operational expenditures by 8 million rubles, the size of the construction territory by 3.5 times, and the number of maintenance personnel by 2.2 times.

Twelve high-output primary petroleum refining facilities were placed into operation in 1976-1980.

Owing to enlargement of the unit output capacities of pyrolysis facilities the availability of raw hydrocarbons--low molecular weight olefins, dienes, aromatic hydrocarbons, used in the production of modern petrochemical products, has increased significantly.

Thus a high-output combined system for acquisition of lower olefins, dienes, and benzene on the basis of thermal pyrolysis of benzene fractions was created within the composition of the Nizhnekamsk petrochemical complex. Owing to new technical concepts this is an economically more effective production operation. It would be sufficient to note that just the aromatic hydrocarbons section, one of the components of the production block, produces up to 180,000 tons of benzene, which is equivalent to the production volume of four or five benzene reforming facilities.

Construction of this production operation made it possible to reduce capital investments by about 30 percent, to decrease product cost by three to four times, and increase labor productivity by four to five times, in comparison with previously employed processes of equal output capacity.

A similar facility for pyrolytic olefin production was placed into operation in 1979 at the Lisichansk Petroleum Refinery. Facilities of this sort are now being erected in the "Gor'knefteogsintez" and "Angarsknefteorgsintez" production associations.

Several combined systems of this type are to be built in major petroleum refining and petrochemical centers in the 11th Five-Year Plan.

Despite certain difficulties, petroleum refining and petrochemical industry developed at a high rate in the 10th Five-Year Plan. The absolute increase in production of the most important types of products, and especially of synthetic petrochemical products, significantly exceeded the indicators of the previous five-year plan.

Thus the absolute increment in production of A-76 gasoline was 40 percent, and that of AI-93 gasoline was 71.7 percent, given a total increase of 13.6 percent in motor vehicle gasoline production. As a result the proportion of high-octane gasolines increased from 50 to 64.7 percent of total gasoline production. Diesel fuel production volume increased by 22 percent. In addition, there was also a significant increase in production of important petroleum products such as solid paraffins--almost 10 percent, liquid paraffins--by 1.7 times, and petroleum coke--by 18.9 percent, including a 13.6 percent increase in electrode coke.

Petrochemical production developed at an especially high rate: The output of ethylene increased by almost 42.9 percent, while that of propylene increased by almost 1.7 times, benzene production increased by 1.5 times, and the output of para- and orthoxylols grew by more than 2 and 3.4 times respectively.

Production of synthetic rubber adequately substituting natural rubber increased by more than 30 percent during the 10th Five-Year Plan; in this case the unit output capacities of new isoprene rubber production operations doubled.

Continued growth in tire production--20.7 percent, and mainly production of radial tires, the growth of which surpassed the level at the beginning of the 10th Five-Year Plan by more than two times, was accompanied by a rise in tire life. Thus the average wear of truck tires increased from 79,800 to 86,400 km, while that of passenger car tires increased from 41,000 to 45,300 km. Significant changes occurred in development of the technical base of tire industry owing to introduction of progressive forms of equipment such as semiautomatic assembly lines, automatic vulcanization flow lines, high-productivity mixing equipment, and so on.

Broad introduction of advanced production processes and equipment into industrial rubber articles industry during the last five-year plan made it possible to significantly increase the proportion of industrial rubber goods obtained by compression molding in continuous production processes; assimilation of a new liquid extrusion method for production of large-sized industrial rubber articles out of polyurethanes has been started.

A distinguishing trait of the development of petroleum refining and petrochemical industry in the 10th Five-Year Plan was renovation and expansion of the product assortment. More than 500 new types of products were assimilated, to include ones such as: motor oils for high compression engines; "needle" coke; SKI-3-01, BK-2045M, SKDP-N, and SKEP synthetic rubber; motor vehicle tires for "Ikarus" buses, radial tires with metallic cord in the braker for VAZ motor vehicles, "Shkoda DTR" trolley buses, K-701 tractors, and so on; single-lining conveyor belts made from polybasic capron fabric; PM-105 industrial carbon raising tire wear by 3-5 percent in comparison with PM-100 industrial carbon, and many other types of articles.

Successive development of the sector in the 10th Five-Year Plan foresaw creation of industrial petroleum refining and petrochemical centers both in the union republics and in West and East Siberia and in the Far East with the goal of implementing the party's policy aimed at improving territorial distribution of the production of petroleum and petrochemical products, and more-harmonious development of the country's productive forces.

New construction projects of great importance also appeared in the past five-year plan, to include the Pavlodar Petroleum Refinery, the Mazheykyay Petroleum Refinery, and the Tobol'sk Petrochemical Combine. The petroleum refineries in Pavlodar and Mazheykyay are already playing an important role not only in the economies of the individual union republics but also the country as a whole.

As foreseen by the draft "Basic Directions", the commissioning of production capacities at the Tobol'sk Petrochemical Combine will promote development of the largest petrochemical complex in northwest Siberia utilizing byproduct petroleum gas.

High-output integrated petroleum refining and petrochemical complexes were created in the Ukraine, Belorussia , Lithuania, Turkmenia, Uzbekistan, and the Bashkir and Tatar ASSR.

Implementation of an integrated program to reequip existing enterprises on the basis of the latest achievements of science and technology played adecisive role in raising industrial potential and increasing production effectiveness in the past five-year plan. Emphasis on fundamental reconstruction of the plants, which was started back in the Ninth Five-Year Plan, is promoting not only significant savings of capital investments, but it is also an important prerequisite for satisfaction of the national economy's growing demand for petroleum products.

Output capacities have been increased in the "Bashneftekhimzavody" territorial association through reconstruction and modernization. A large petroleum refining complex in the city of Groznyy was reconstructed with relatively low outlays without stopping the production processes.

The commissioning of the second generation of a huge complex producing isoprene rubber was an important stage in reequipment of the Yaroslavskiy Synthetic Rubber Plant. This significantly increased the total synthetic rubber production volume of this plant, a veteran in the sector.

The 10th Five-Year Plan also saw the beginning of production renovation at enterprises of the sector such as the Novopolotsk and Ryazan' petroleum refineries, the "Angarsknefteorgsintez", "Permnefteorgsintez", and "Omskshina" production associations, and others.

Discussing the basic directions of technical policy being followed by the sector in the 10th Five-Year Plan, special mention should be made of the tremendous attention that was devoted to improving the qualitative structure of production. In 1980 the proportion of top quality articles and products was more than 38 percent of the total production volume. The number of names of petroleum and petrochemical products on par with the best articles in the world climbed to 2,200.

The increase in technical level and quality of products was achieved owing to implementation of a far-reaching program to develop and introduce a sector product quality control system, and to develop integrated product quality control systems in production associations and enterprises. It would be sufficient to point out that the total economic impact from introducing these systems into the sector's enterprises was about 40 million rubles as of the beginning of 1980.

The 10th Five-Year Plan was a time of further development and reinforcement of the sector's scientific base, which plays the dominant role in organic unification of the achievements of the scientific-technical revolution with the advantages of socialism. During the last five-year period significantly more assets were invested into scientific research than in previous five-year plans. Practically all sectors of petroleum refining and petrochemical industry have their own specialized scientific research and planning organizations. Owing to the high level of the scientific research and effective use of the achievements of science and technology in the sector, just in 1976-1980 product cost was reduced by more than 300 million rubles, and the national economy saved about 1.5 billion rubles.

Emphasis on the intensive factors of the sector's development necessitated constant and purposeful implementation of measures developed by the party for improving the planning and organizational forms of production control.

Transition to control in a trilevel system was an important stage in improving the administrative structure of petroleum refining and petrochemical industry: Nine all-union industrial associations and 28 production associations were created within the ministry. Reorganization of the sector's administrative structure had the main objective of improving cost accounting and increasing its role in raising production effectiveness and work quality, and of developing socialist enterprise. Creation of industrial and production associations additionally made it possible to implement a unified technical policy based on organic unity of science and production.

Development of economic ties between the different levels of control, the dynamic nature of production, and the growing complexity of problems associated with making optimum management decisions were the most important stimuli for development and introduction of automated control systems in the 10th Five-Year Plan, particularly the "Neftekhimprom" branch automated control system (OASU).

Successful attainment of the 10th Five-Year Plan's targets was promoted to a significant degree by further development and introduction of progressive forms of production and labor organization, such as the Shchekino method and the method of collective interchangeable services.

Describing the basic directions for improving production control and organization in petroleum refining and petrochemical industry in the 10th Five-Year Plan, we should note specially the implementation of a complex of measures to fulfill the requirements of the 12 July 1979 decree of the CPSU Central Committee and the USSR Council of Ministers, "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality".

One of the most important measures of the program for implementing this decree was the work done in 1980 to introduce a registration system into the sector's production associations and enterprises.

Use of information on the registration certificates to draft annual and five-year plans significantly raises the stability and technical-economic validity of the latter, and encourages labor collectives to work toward maximum economization, and to strengthen planning, production, and labor discipline.

Conversion of a number of enterprises to a system for evaluating their activities on the basis of the normative net production index was an inherent part of the effort to improve the economic mechanism, in accordance with the CPSU Central Committee and USSR Council of Ministers decree.

Summarizing what has been done and analyzing the road we have traveled, we can say that during the last five-year plan, petroleum refining and petrochemical industry attained new qualitative summits in its effort to increase its industrial potential, raise work effectiveness and quality, and improve the economic mechanism.

A new, important stage in economic and cultural construction and in the creative activity of the Soviet people is the forthcoming 11th Five-Year Plan. Growth in the effectiveness of all social production, labor productivity, and the social activity and labor of Soviet people will play the main role in completing the most important tasks of the country's economic and social development, as defined for this period by the CPSU Central Committee draft report.

The 11th Five-Year Plan is called upon to insure further growth of the welfare of the Soviet people on the basis of consistent and progressive development of the national economy, acceleration of scientific-technical progress, conversion of the economy to an intensive path of development, more-sensible use of the country's production potential, all-out economization of all types of resources, and improvement of work quality.

Grandiose tasks of major importance face petroleum refining and petrochemical industry in the new five-year plan and in the period to 1990. The general direction of the sector's development has been stated as raising the effectiveness of petroleum use, deepening its refining, reducing the losses of petroleum and petroleum products, improving the distribution of petroleum refineries, and fundamentally developing pipeline transport. The CPSU Central Committee's draft report to the 26th CPSU Congress calls for assimilating high-capacity production of aromatic hydrocarbons, liquid paraffins, ethylene, and electrode petroleum coke in petrochemical industry. In addition we need to increase production of highly effective fuel and lubricating oil additives, raise the quality of petroleum products, and promote continued unification of the brands of lubricating oils, lubricants, and engine, boiler, and furnace fuels. The laborers of petroleum refining industry have been given the task of achieving the entire planned increment in production volume basically through growth in labor productivity.

If we are to achieve the goals specified by the CPSU Central Committee's report, we will need to devote special attention in petroleum refining industry to introduction of highly effective fuel oil refining processes at modern petroleum refining systems, and to assimilating new catalysts, primarily for processes such as catalytic cracking, catalytic reforming, and hydrorefining.

Implementation of the program for development of petroleum refining industry's technical base is inseparably associated with further enlargement of the unit output capacities of the facilities, production operations, and enterprises, and combination of production processes. All of this will make it possible to achieve sensible use of crude oil, improve the qualitative structure of petroleum products, develop petrochemistry's raw material base faster, and reduce the energy requirements of production.

Thus the 11th Five-Year Plan calls for broadly introducing highly productive combined production systems for full petroleum refining, to include crude isolation and hydrorefining, catalytic cracking or hydrocracking, rectification, and gas fractionation processes.

High-capacity, highly effective processes will also play the main role in organic synthesis industry, mainly in the production of ethylene, higher alcohols, 2-ethylhexanol, butanol, mineral fertilizers, and many other products.

Our country's synthetic rubber industry, which now holds a leading place in the world, faces great tasks in the 11th Five-Year Plan. The draft "Basic Directions" foresee further increase in the production of synthetic rubber as a substitute for natural rubber. One distinguishing trait of this industrial sector's development in the forthcoming period will be assimilation of the production of new types of synthetic rubber, such as ethylenepropylene rubber, copolymer rubber polymerized out of solution, and thermoplastics. Among the traditional forms of rubber, priority attention is being devoted to development of the production of stereoregular rubber--SKI and SKD.

Further improvement of radial tires will be the principal direction in development of tire industry.

Production of oversized tires is to be initiated and tubeless truck tires and new tire designs for modern passenger cars are to be developed during the 11th Five-Year Plan.

One of the most important tasks facing tire industry in the new five-year plan is raising the life of tires, their principal qualitative indicator. A further increase in the proportion of synthetic rubber in the total volume of rubber used in tire production must be insured in this case.

An integrated program of development of industrial rubber articles industry is to be implemented in the forthcoming period. Technical progress in production of industrial rubber articles will be based mainly on broad introduction of progressive processes such as compression molding, liquid extrusion, and a continuous method for manufacturing nonmolded articles entailing vulcanization in salt melt, and by high frequency currents.

The fullest possible satisfaction of the demand of animal husbandry for protein-vitamin concentrates is the most important task of petroleum refining and petrochemical industry in the 11th Five-Year Plan. This is to be done by implementing a program to build "Pareks" systems as a means for increasing the production of liquid paraffins.

Much attention will be devoted in the new five-year plan to production of cultural, personal, and household goods of increasingly better quality.

Completion of the complex, important tasks posed to petroleum refining and petrochemical industry by the CPSU Central Committee's draft report to the 26th CPSU Congress requires not only acceleration of the rate of scientific-technical progress, improvement of the structure of industrial production, reduction of the material and energy requirements of production, and improvement of product quality, but also improvement of the sector's control and management.

The draft "Basic Directions" foresee an integrated program aimed at improving control of the national economy and finishing the economy's conversion to intensive development.

Fulfillment of the party's decisions associated with improving the economic mechanism and intensifying its influence on raising effectiveness and quality and at improving the organizational structure of control, and the style and methods of work, is the most important prerequisite for implementation of the enormous program for development of petroleum refining and petrochemical industry in 1981-1985 and in the period to 1990.

Developing initiative and creativity, the sector's laborers have started the new decade in an atmosphere of high political enthusiasm, being fully resolved to make this a decade of further growth of work effectiveness and quality, and to make a worthy contribution to increasing our country's national wealth and raising the welfare of the Soviet people.

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